Tribhuvan University
Institute of Science and Technology
2080
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Full Marks: 60
Pass Marks: 24
Time: 3 hours.

Bachelor Level / Second Year/ Fourth Semester
Bachelors in Information Technology (ORS255)
(Operations Research)

Candidates are required to give their answers in their own words as for as practicable.
The figures in the margin indicate full marks.

Section A

Long Answer Questions
Attempt any TWO questions.

(2 × 10 = 20)

1. A milkman buys milk at Rs. 20 per litre and sells at Rs. 25 per litre. Unsold milk has to be thrown away. The daily demand has the following probability distribution:

Demand (litres)	46	48	50	52	54	56	58	60	62	64
Probability	0.01	0.03	0.06	0.10	0.20	0.25	0.15	0.10	0.05	0.05

   If each day's demand is independent of previous day's demand, using marginal analysis approach, how many litres should be ordered everyday so as to maximize the profit? Also find
   (a) Max. EMV
   (b) EPPI
   (c) EVPI.

2. Determine the minimum transportation cost from the following matrix.

Warehouse	Stores				Supply
	P_1	P_2	P_3	P_4	
	Cost per unit				
W_1	45	60	45	30	70
W_2	35	15	35	35	60
W_3	30	25	45	55	90
Demand	60	40	60	20	220 / 180

3. Solve the given linear programming problem (LPP) by using simplex method and interpret the findings.

   Min $Z = 20A + 10B$
   Subject to
   $$A + 2B \le 40$$
   $$4A + 3B \ge 60$$
   $$3A + B \ge 30 \text{ and } A, B \ge 0$$

Section B

Short Answer Questions
Attempt any EIGHT questions. (8 × 5 = 40)

4. There are three jobs P, Q and R to be completed on four machines A, B, C and D. The costs of performing the different jobs on different machines are given below. Assign the jobs to different machines to minimize the total cost of performing the jobs on machines.

Jobs	Machines			
	A	B	C	D
P	90	120	140	160
Q	40	65	85	95
R	50	75	95	110

5. A TV repairman finds that the time spent on his job has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hour day. What is his expected idle time each day? How many jobs are ahead of the set just brought in?

6. Assume that two firms are competing for market share for a particular product. Each firm is considering what promotional strategy to employ for the coming period. Assume that the following payoff matrix describes the increase in market share of Firm A and the decrease in market share for Firm B.

Firm A	Firm B		
	No promotion	Moderate promotion	Much promotion
No promotion	5	0	-10
Moderate promotion	10	6	2
Much promotion	20	15	10

Find the optimal strategy for each firm. Also determine value of the game.

7. Describe Hungarian Assignment Method (HAM) used for finding the optimal solution of assignment problem.

8. The following activities must be completed in order to complete the project. Determine critical path and time duration of the project.

Activity	A	B	C	D	E	F	G	H	I	J
Predecessor	–	–	A, B	B	A	C	E, F	D, F	G, H	I
Time (in week)	3	8	4	2	1	7	5	6	8	9

9. A food company at Kathmandu produce three types of a healthy food P, Q and R for children which contains three types of vitamin A, B, and C. Each unit of food P contains 2, 2 and 1 unit of vitamin A, B and C. One unit of food Q contains 2, 3 and 1 units while each unit of food R contains 1, 1 and 5 units of vitamin A, B and C respectively. Daily minimum requirements of vitamin A, B and C are 10, 12 and 14 units respectively. Formulate objective function and its constraints of LPP if cost per unit of food P, Q and R are Rs. 9, Rs.12 and Rs.15 respectively.

10. Describe the scope of operations research in different fields.

11. What is called a queue? Describe different queue disciplines.

12. Write short notes on:
    a) Marginal Analysis Approach in decision making.
    b) Arithmetic Method in game theory.